主幹 薬学博士 朝比奈泰彦

植物研究雑誌

THE JOURNAL OF JAPANESE BOTANY

第32巻 第8号 (通巻第355号) 昭和32年8月 発行

Vol. 32 No. 8 August 1957

Yoshiwo HORIKAWA* and Hisatsugu ANDO*: **Phytogeographical notes on *Hypnum subimponens* Lesq. and *H. dieckii* Ren. & Card.****

堀川芳雄*・安藤久次*: *Hypnum subimponens* Lesq. と *H. dieckii* Ren. & Card. の分布について**

There is a close relationship between North America and the Japanese Archipelago in relation to the bryophytic flora. Numerous species of bryophytes have been recognized as being common to both areas. Most of these species belong to the holarctic element and only a few to the North Pacific, tropical or cosmopolitan element. Plants of the North Pacific element are distributed along the northern Pacific coast, in Asia from Kamchatka to Formosa and in North America from California to Alaska. They are *Macrodiplophyllum plicatum*, *Ptilidium californicum*, *Scapania bolanderi*, *Bartramiopsis lescurii*, *Mnium flagellare*, *Oligotrichum aligerum*, *Pleuroziopsis ruthenica*, *Pogonatum contortum*, etc.

Hypnum subimponens Lesq. and *H. dieckii* Ren. & Card. hitherto known to occur only in western North America have been found to exist in Japan and certain adjacent areas. This paper deals with these North Pacific species of *Hypnum* which were previously unknown in Asia, with special reference to their distribution and ecology.

The authors wish to express their thanks to Mr. W. B. Schofield of Nova Scotia, in providing much valuable data on the North American distribution of the species in question. Thanks are also due to several institutions and bryologists who have assisted them by loans or gifts of specimen.

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** Contributions from the Phytotaxonomical and Geobotanical Laboratory, Hiroshima University, N. Ser. No. 38.

Hypnum subimponens Lesq.

Hypnum subimponens Lesq. in Trans. Am. Phil. Soc. **13**: 14 (1863); Grout, Moss Flora N. Am. III, **3**: 127 (1932)—*Stereodon plumifer* Mitt. in Journ. Linn. Soc. **8**: 41 (1865).

Hypnum subimponens belongs to the group of species whose stems have large and thin-walled epidermal cells, and often appears much like other species of the same group, such as *H. callichroum*, *hamulosum*, *plicatulum*, etc. From *callichroum* and *plicatulum*, it is distinguished by the non-differentiated alar cells and by the larger and non-cordate leaves respectively. When plants of *H. subimponens* are modified and of small size, they seem to approach *H. hamulosum* very closely and it is difficult to separate it from the latter. The plants in Japan show a slight variation from N. American types in the form of the capsule, but in other respects such as the stem structure, leaf shape, areolation, peristomes, exothecial cells, spores, etc., they are recognized to be identical. Accordingly the authors believe at present that the Japanese plants may be treated under the same specific category as the N. American *H. subimponens*. As far as observations have been made on Japanese specimens, this species is quite variable in the shape and length of capsule and also in the size of the plant in having a tendency to become larger in southern localities or lower elevations.

From the material examined by the authors, a map showing the distribution of this species in Japan has been compiled (Fig. 1). The species is known from 32 localities, most of which are situated in the northeastern half of Japan. As clearly seen in figure 2, which indicates the vertical distribution, the species occurs

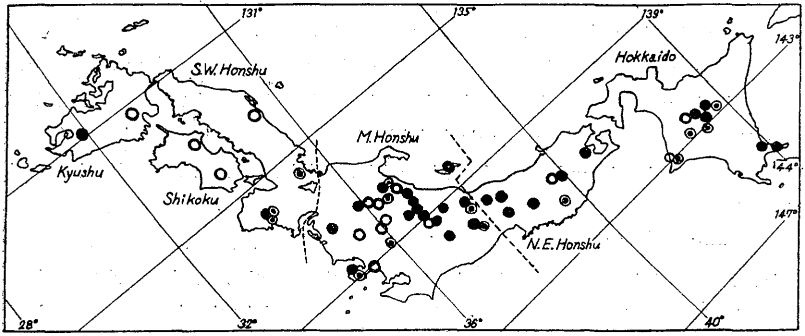

Fig. 1. Distribution of *H. subimponens* (open circles) and *dieckii* (solid circles) in Japan. Doubled circles show the occurrence of both species.

exclusively in the zones of both temperate deciduous broad-leaved and subalpine or subarctic coniferous forests, and is not found in the lowland or alpine areas. As a result of the authors' study, the highest elevation attained by the species is on Mt. Shiroiwa in Chichibu where it ascends to 1850m above sea-level and the lowest is 200m in Samani, Hokkaido. With respect to the substratal feature, the result given below has been obtained from an examination of 27 specimens.

Rock	Bark	Decayed wood
51.9%	40.7%	7.4%

Figure 3 shows the total range of the two species in question. In N. America *H. subimponens* grows along the Pacific coast from California to Alaska (excl. the Aleutian Is.). Macoun reported this species from New Brunswick and Newfoundland on the opposite coast, but a personal communication from Mr. Schofield remarks that the Macoun's specimens have been proved to be both *H. imponens*. In Asia it is distributed in Amur,* Korea and Formosa besides Japan.

Specim. exam.** Hokkaido. Tokachi: Shikaribetsu-numa (ST-10037), Mt. Memuro (ST-15405); Ishikari: Aizan-kei (ST-23993), Tennin-kyo (ST-19654), Mt. Yubari (ST-18373), Simukappu-mura (ST-11157); Hidaka: Samani (ST-24432). N. E. Honshu. Iwate: Mt. Hayachine (A-14379, 14341, I-27730); Akita: Mt. Komagatake (Kobayashi- Herb. Nat. Sci. Mus. Tokyo, n. 1724). M. Honshu. Fukushima: Iizaka-machi (H-2483), Yama-gun, Mt. Jizo (A-14754); Gumma: Tone-gun, Tokura～Hatomachi-toge (A-3211); Saitama: Chichibu, Mt. Shiroiwa (I-20979), Mt. Akazawa (NG-4536); Kanagawa: Hakone (I-25972, T. Ozaki-125945); Niigata: Renge-onsen (I-11276), Mt. Korenge (I-11312, 11313, 11317); Toyama: Kurobe-kyo (I-39227); Nagano: Omachi (Y. Matsuda-A22225, 22226), Tokugo-toge (T. Seki-3615), Mt. Norikura (K. Morimoto-A18365), Kirigamine (T-8854), Mt. Yatsugatake (T-4689, 4706), Mt. Akaishi (T-6699); Shizuoka: Mt. Amagi (A-8467, 8497, NG-2941). S. W. Honshu. Kyoto: Kitakuwada-gun, Ashu Enshurin (NK-5627, 5687); Nara: Mt. Sanjo (T. Kodama-8884), Mt. Odaigahara (NK-6100, M. Mizutani-1933); Tottori: Mt. Daisen (A-17453, E. Nokubo-A6711). Shikoku. Tokushima: Mt. Tsurugi (O-2819); Ehime: Mt. Ishizuchi (M. Hara-4156, T. Seki-7146). Kyushu. Oita: Mt. Kuzyu (K. Negayama-A22085). Formosa. Tataka∼Niitakashita (A. Noguchi-6545), Niitakashita∼summit (A. Noguchi-6854). Korea. Mt. Kongo (G. Masamune- Herb. Nat. Sci. Mus. Tokyo, n. 2027).

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* According to a personal communication from Dr. Persson, Stockholm.

** The names of the principal collectors are abbreviated as follows:
A—H. Ando, H—T. Higuchi, I—Y. Ikegami, NG—I. Nagano, NK—T. Nakajima, O—H. Ochi, ST—M. Saito, SZ—H. Suzuki, T—N. Takaki, W—R. Watanabe.

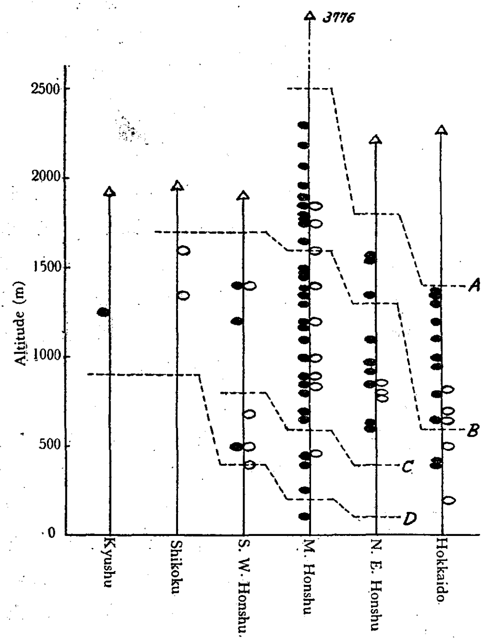

Fig. 2. Vertical distribution of *H. subimponens* (open circles) and *dieckii* (solid circle). △—The highest altitude of the land, A—Approximate mean altitude of the upper limit of subalpine coniferous forests, B—do. of temperate deciduous broad-leaved forests, C—do. of warm-temperate deciduous broad-leaved forests, D—do. of evergreen broad-leaved forests.

Range. N. America (California, Oregon, Washington, British Columbia, Yukon, Alaska), Japan (Hokkaido, Honshu, Shikoku, Kyushu), Formosa, Korea, Amur.

Hypnum dieckii Ren. & Card.

Hypnum dieckii Ren. & Card. in Bot. Centralbl. **44**: 423 (1890); Grout, Moss Flora N. Am. III, **3**: 128 Pl. 33 (1932)—*Hypnum canadense* Kindb. in Bull. Torr. Bot. Club **17**: 280 (1890)?—*Stereodon pulchroalaris* Broth. et Yasuda in Över. Finska Vet.-Soc. Förh. **62**: 39 (1919∼'20)—*Brotherella pulchroalaris* Broth. in Engl.-Pr. Pflfam. ed. 2, **11**: 425 (1925)—*Calohypnum pulchroalare* Sakurai in Journ. Jap. Bot. **25**: 220, fig. 2 (1950)—*Stereodon tamakii* Broth. in Över. Finska Vet.-Soc. Förh. **62**: 39 (1919∼'20)—*Hypnum tamakii* Broth. in Engl.-Pr. Pflfam ed. 2, **11**: 454 (1925): Ihsiba in Yadu, Nikko no Syokubutu to Dobutu 186, fig. 4 (1936); Doignon in Rev. bryol. **22**: 46 (1953)—*Brotherella fulvoaurea* Dix. in sched., Herb. Nat. Sci. Mus. Tokyo—*Stereodon amblyostegius* Mitt. sensu Okamura in Journ. Coll. Sci. Tokyo Imp. Univ. 36, **7**: 33, Tab. 16, F∼K (1915)—*Hypnum hamulosum* B. S. G. sensu Hisauchi in Journ. Jap. Bot. **38**: 30 (1953)—*Hypnum circinatulum* Schimp. sensu Yano in Bot. Mag. Tokyo **68**: 196 (1955).

From Japan this species has been known under two synonymous taxa: *Hypnum tamakii* and *Brotherella pulchroalaris*. The authors' examination of authentic specimens of N. American *H. dieckii*, which were supplied through the courtesy of Dr. Crum of the National Museum of Canada, has revealed that it is not specifically distinct from the above-mentioned Japanese taxa (both types seen). *H. dieckii* is a species which has been rather inadequately understood and sometimes confused with other species such as *H. callichroum*, *imponens*, *oldhami* (=*circinatulum*), etc. There is a closer resemblance to *H. callichroum*, especially when sterile. According to the authors' observation, the main characteristics which separate this species from *callichroum* are the color of the plant (sometimes tinged with red), the leaves with shorter acumen and always colored with reddish-brown at the base, the larger and swelled capsule, and the far larger size of the spores (25～30μ in *dieckii*, 12～15μ in *callichroum*). This species is considerably variable in both color and size.

The distribution in Japan is shown in figure 1. The known localities are 64, in total, mostly in the northeastern half of Japan. The species is apparently less frequent or lacking in the southwestern regions. The feature of its vertical distribution is almost the same as in *subimponens*, except that this species reaches higher elevations the extreme being 2300m on Mt. Ontake. It is noteworthy that this and the preceding species were both found at low elevations in the Izu Peninsula (*dieckii* in Doi-machi 100m and Nishina-mura 400m, *dieckii* and *subimponens* on Mt. Amagi 830-1200m) and Ashu Enshurin (400～500m) which are located in rather southern part of Japan, and a fact of further interest is that *H. dieckii* was found mostly in water in these localities, which suggests that the living of the plants is easier under such submerged habitat condition in the peripheral part of the range. The substratal feature was studied with respect to 52 specimens. The result is:

Rock	Soil	Decayed wood	Trunk-base
69.2%	19.2%	9.6%	2%

This species occurs most commonly on rock and is less frequent on other substrata. It seems to find better conditions for its growth in wet places and is occasionally found in shallow water. Five of the examined specimens were collected in water, and they exhibit a distinctly modified form, namely irregular and sparing ramification and laxer foliation. In N. America this species is distributed along the Pacific coast from Oregon to Alaska (including the Aleutian Is.). In Asia it is known at present only from Japan.

Specim. exam. Hokkaido. Nemuro: Mt. Rausu (ST-14430, 14449, 14453); Kitami: Mt. Shari (O-1346, A-2844, 2847, 2883); Tokachi: Mt. Petotoru (ST-10072), Mt. Tokachi (ST-4594), Mt. Rakko (ST-26336, 26356, 26362, 26380, 26386, 26430, 26455, 26461, 26472, 26477), Mt. Memuro (ST-15153, 15405); Ishikari: Aizan-kei (ST-23941, 23946, 23961), Biei-machi, Shirakane-onsen (ST-22399), Furano-machi (ST-12502), Upper part of the Nunobe river (ST-18304). N. E. Honshu. Aomori: Mt. Hakkoda (SZ-7180, T. Ozaki-I18608, 30983), Mt. Iwaki (O-3120); Iwate: Hachimantai (SZ-12135), Mt. Hayachine (A-14447, 14473, I-27975, 27976), Nishiiwai-gun, Itsukushi-mura (A-14571, 14583, 14654), Mt. Kurikoma (A. Yasuda-Herb. Nat. Sci. Mus. Tokyo, n. 2603, det. Broth. as *Brotherella pulchroalaris*); Yamagata: Mt. Funagata (K. Shyoji-I37410), Mt. Gassan (H-517), Mt. Asahi (SZ-15876, 15888). M. Honshu. Fukushima: Yama-gun, Mt. Jizo (A-14788), Mt. Azuma (SZ-16605), Iizaka-machi (H-2547), Mt. Bandai (W-1191), Shinobu-gun, Maku-onsen (W-1515), Yakeyama (H-1650), Mt. Hiuchi (A-8992, 9023, 9085), Prov. Iwashiro, sine loco designato ad terram (Hattori- type of *Stereodon pulchroalaris* in Herb. Broth. Helsinki Univ.); Tochigi: Mt. Nasu (W-993, 1503); Gumma: Oze (A-900), Tone-gun, Yomogi-toge (K. Yagi-I-32546), Mikuni-toge (I-34661), Tone-gun, Niiharu-mura (S. Imanari-A21732), Azuma-gun, Bog Nozori (K. Hisauchi-in Herb. Noguchi, det. Noguchi as *H. hamulosum*); Saitama: Chichibu, Kawa-

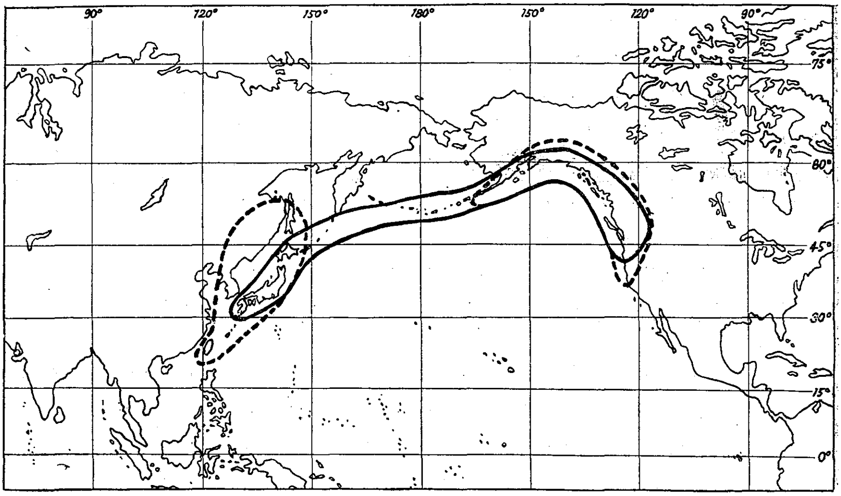

Fig. 3. Total range of *H. subimponens* (broken line) and *diekii* (unbroken line).

mata〜Karisaka-toge (NG-4134, 4371); Niigata: Mt. Iburisashi (T. Ozaki-I22251), Mt. Iide (A-14877), Kitakanbara-gun, Mt. Nioji (I-42623, 42624), Rokujuri-goe (I-38376), Mt. Tanigawa (I-37923), Tsuchidaru (I-37573, 37624, 37664), Mt. Ogenta (I-18196), Minamiuonuma-gun, Hachimaki-toge (K. Yagi-I30974), Mt. Naeba (I-18268), Tsubame-onsen (K. Yano-1265), Mt. Myoko (K. Yano-880, det. Yano as *H. circinatulum*, O-4369, M. Iwasaki-Herb. Nat. Sci. Mus. Tokyo, n. 2021, labelled as *H. tristoviride*), Mt. Amakazari (K. Yano-198, det.Noguchi as *H. circinatulum*), O-4369, M. Iwasaki-Herb. Nat. Sci. Mus. Tokyo, n. 2021, labelled *H. tristoviride*, Mt. Amakazari (K. Yano-198, det. Noguchi as *H. circinatulum*), Etigo, Sanegawa (Tamaki-type of *Stereodon tamakii* in Herb. Broth. Helsinki Univ.), Sado, Totegawa (K. Homma-I-36958); Toyama: Mt. Tateyama (A-15699, 15738, 15786, E. Nokubo-A6629), Kurobe-kyo (T. Ozaki-I22401, I-38996, 39063, 39083, 39124, A-15910, 15915, K. Sinno-Herb. Nat. Sci. Mus. Tokyo, n. 2449, original specim. of *Brotherella fulvoaurea*); Nagano: Shimotakai-gun, Sakai-mura (S. Ito- in Herb. Hattori Bot. Lab., det. Okamura as *Stereodon amblyostegius*), Omachi (Y. Matsuda-A22227), Mt. Ontake (A-20012, 20022, I-8682); Shizuoka: Tagata-gun, Doi-machi (T. Haneda-I44991), Kamo-gun, Nishina-mura (T. Haneda-I44082), Mt. Amagi (A-8471); Gifu: Mt. Ontake (Y. Sasaki-A15271, 15275); Aichi: Mt. Dando (Toyama-1575). S. W. Honshu. Kyoto: Kitakuwada-gun, Ashu Enshurin (M. Mizutani-387); Nara: Mt. Sanjo (T. Nakanishi-A3622), Mt. Misen (NK-3000), Mt. Omine (NK-7529), Mt. Odaigahara (K. Saito-Herb. Nat. Sci. Mus. Tokyo, n. 2025, labelled as *H. tristoviride*). Kyushu. Kagoshima: Mt. Kirishima (T. Shin-8899).

Range. N. America (Oregon, Washington, British Columbia, Alaska), Japan (Hokkaido, Honshu, Kyushu).

Literatur cited: Brotherus V. F. 1919〜'20. Musci novi japonici. Över. Finska Vet.-Soc. Förh. **62**: 1〜55. Grout A. J. 1932. Moss Flora of North America III, **3**. Persson H. 1954. Mosses of Alaska-Yukon. The Bryologist **57**: 189〜217.

摘　要

Hypnum subimponens Lesq. と *H. dieckii* Ren. & Card. (蘚類) は従来北米の北部太平洋岸地域にのみ知られていたが，前者は日本 (北海道，本州，四国，九州) 及びその近接地域 (アムール，朝鮮，台湾) に，後者は日本 (北海道，本州，九州) にも産することがわかつた。両種共本州中部以北により多く生じ，主としてブナ帯〜針葉樹林帯に分布する。なお Brotherus (1919〜'20) により *Stereodon tamakii*, *S. pulchroalaris* として日本から記載された種はいずれも *H. dieckii* に一致する。